



AEC-NASA TECH BRIEF



AEC-NASA Tech Briefs describe innovations resulting from the research and development program of the U.S. AEC or from AEC-NASA interagency efforts. They are issued to encourage commercial application. Tech Briefs are published by NASA and may be purchased, at 15 cents each, from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Analysis of Cell Performance and Thermal Regeneration of a Lithium-Tin Cell Having an Immobilized Fused-Salt Electrolyte

Cell performance and thermal regeneration of a thermally regenerative cell using lithium and tin and a fused-salt electrolyte in an inert porous matrix are reported (ref. 1).

The use of thermally regenerative galvanic cells has been proposed for both space and terrestrial applications where various heat sources are available and electricity is required. These cells are considered to be medium-efficiency (6–20%) devices that can operate under a variety of thermal conditions.

Thermally regenerative galvanic cells have the advantages of flexibility in heat-source requirements, silence, lack of moving parts, and simplicity in principle; having fused-salt electrolytes and liquid-metal electrodes they have the additional advantages of very low internal resistances, high exchange-current densities (corresponding to low overvoltages), and simple current collection, all of which make for compact cells that operate at high power densities.

Several thermally regenerative cells with fused-salt electrolytes were investigated in detail. This work deals with some aspects of the Li-Sn thermally regenerative system. The emf of the cell, as a function of cathode-alloy composition, is shown to resemble that of the Na-Bi cell. One advantage of the Li-Sn system is that anode and cathode materials have lower equivalent weights than Na and Bi. Furthermore the volatility of Sn is much lower than that of Bi, and the distillate from the cathode alloy is of much higher purity in the case of Li-Sn. The cell portion of the Li-Sn system can operate below 400°C, so that the solubility of Li in the electrolyte is reduced to a very low value and the rate of self-discharge is lowered far below that in other and similar cells.

To provide a system that is relatively insensitive to position and movement, it is desirable to immobilize

the electrolyte. In this work a paste electrolyte composed of fused LiF-Li-Cl-LiI eutectic and an inert ceramic filler, such as LiAlO_2 , was preferred to the more conventional porous ceramic matrix because of its lower resistivity. The regeneration problems and materials stability are discussed in detail.

Reference:

1. Shimotake, H.; Cairns, E. J.: A Lithium/Tin Cell with an Immobilized Fused-Salt Electrolyte: Cell Performance and Thermal Regeneration Analysis. Argonne National Laboratory, March 1968.

Notes:

1. This information may interest researchers in the fields of fuel cells and energy-conversion.
2. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
Reference: B69-10627

Source: H. Shimotake, E. J. Cairns
Chemical Engineering Division
(ARG-10453)

Patent status:

Inquiries concerning rights for commercial use of this information may be made to:

Mr. George H. Lee, Chief
Chicago Patent Group
U.S. Atomic Energy Commission
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Category 03

